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Economic Reforms and Total Factor Productivity Growth in Latin America and the Caribbean (1950–95)

An Empirical Note

Pablo Fajnzylber
Daniel Lederman

On average, economic reforms in Latin America and the Caribbean have been associated with a 1.5 percent yearly increase in the growth rate of total factor productivity. But there are important differences across countries, and in some cases economic reforms have been associated with lower growth in total factor productivity.

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Summary findings

Fajnzylber and Lederman rely on a series of growth accounting exercises to determine whether the growth rate of total factor productivity (TFP) or the unexplained portion of GDP growth (after controlling for the accumulation of capital per worker) in 18 Latin American and Caribbean economies has benefited from economic reform.

They use Sachs and Warner (1995) criteria to identify the years of economic reform. They apply growth decomposition analysis and econometric tests to determine whether TFP growth has been significantly higher during periods of economic reform.

Although the growth decomposition analysis assumes that the capital share of output is constant across Latin American countries, the econometric estimates allow for cross-country differences. In ordinary least squares (OLS) regressions and seemingly unrelated regressions (SUR), two alternative dummy variables are used to control for the effects of business-cycle fluctuations on observed rates of TFP growth. In addition, the SUR regressions consider the possibility that Latin American economies face common shocks.

Finally, panel regressions are based on five-year averages of the growth rates of GDP and capital per worker.

The authors find that, on average, economic reforms have been associated with a 1.5 percent yearly increase in the rate of TFP growth. But there are important differences across countries and in some cases economic reforms have been associated with lower TFP growth.

This paper — a product of the Poverty Reduction and Economic Management Sector Unit, Latin America and the Caribbean Region — is part of a larger effort in the Bank to undertake regional studies to shed light on policy-relevant issues. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Sandra Holt, room I8-122, telephone 202-473-7859, fax 202-614-0235, Internet address sholt@worldbank.org. Policy Research Working Papers are also posted on the Web at http://www.worldbank.org/html/dec/Publications/Workpapers/home.html. Daniel Lederman may be contacted at dlederman@worldbank.org. May 1999. (23 pages)

Economic Reforms and Total Factor Productivity Growth in Latin America and the Caribbean, 1950-95: An Empirical Note

by Pablo Fajnzylber and Daniel Lederman

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Fajnzylber is a professor of economics at the Universidade Federal de Minas Gerais, in Belo Horizonte, Brazil. Lederman is an economist at the Office of the Chief Economist for Latin America and the Caribbean Region of the World Bank.

Correspondence: Daniel Lederman, World Bank, 1818 H Street, N.W., Washington, DC 20433. E-mail: Dlederman@worldbank.org

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I. Introduction

Most Latin American and Caribbean (LAC) countries implemented economic reforms encompassing a broad range of market-oriented policies during the late 1980s and early 1990s. Partly because of the relatively short period of time that has elapsed since the implementation of the new policies, few studies have dealt with the effects that these policies have had on total factor productivity.[1] The present paper attempts to contribute to this research by estimating average rates of total factor productivity (TFP) growth for eighteen LAC countries in the period 1950-1995, and testing for the existence of changes in these rates during periods of economic reforms. For the categorization and timing of the latter, we follow the criteria suggested by Sachs and Warner (1995) for the characterization of an economy as "open," which we interpret as concurring with periods of broader economic reforms. It should be noted that it is widely recognized that trade liberalization has been accompanied by other policy reforms in Latin America and the Caribbean (see IDB 1996 and Burki and Perry 1997). Based on the Sachs and Warner criteria, all 18 countries "reformed" their economies in the last decade, while 10 of them had temporary episodes of "reform" in the previous decades (mainly in the 1950s). The data that we use comes from the data base on physical capital stocks, working-age population and output, constructed by Nehru and Dareshwar (1993), which we updated until 1995.

[1] Several studies have analyzed the impact of economic reforms -- measured by performance and policy-based indicators -- on the rate of growth, see Easterly, Loayza, and Montiel (1997). Solimano (1996) argues that the growth effects of stabilization and structural reforms may be ambiguous in the short-run, with positive effects being more likely in the medium to long run.

Our main finding is that TFP growth was faster in periods when the LAC countries were "reformed," on average by approximately 1.5 percentage points per year. In fact, the average rate of TFP growth is negative during the periods of "no-reform," and becomes positive during the reform periods. These results were not reflected on a country-by-country analysis, as the effect of the economic reforms on the rate of growth of TFP in individual countries is not always statistically different from zero. When significant, however, this effect is positive.

The diversity of results across countries undoubtedly reflects the wide variety of reforms implemented across the region, both in terms of coverage and scope of the reforms. It is also probably related to the fact that these countries have different structural characteristics. To deal with these issues effectively it would be necessary to examine more disaggregated country data, and to analyze in detail the reforms implemented in each country. These tasks, however, are beyond the scope of this note.

The rest of the paper is organized as follows: Section II presents the data and methodology used in the paper. Section III discusses the results of several empirical exercises. Section IV offers a summary of results and concluding remarks.

II. Methodology

The objective of this paper is the measurement of the effects of economic reforms on TFP growth in eighteen LAC countries. The countries included in the sample were chosen on the basis of data availability; as a group, these countries account for more than 95 percent of the LAC region's GDP. Our methodological approach is to perform a growth accounting exercise based on the assumption that the production function follows a Cobb-Douglas specification with constant returns to scale between capital and labor:

(1) $$Y_t = A_t K_t^{\alpha} L_t^{(1-\alpha)}$$

where Y is output, A is an index of total factor productivity, and K and L are the stocks of physical capital and labor, respectively. Dividing both sides by the size of the work force, taking logs, and first-differencing, yields an equation that relates the rate of change in output per worker (y) to the rates of change of TFP and capital per worker (k):

(2) $$\ln(y_t / y_{t-1}) = \ln(A_t / A_{t-1}) + \alpha \ln(k_t / k_{t-1})$$

We then assume that the rate of growth of TFP can be expressed as a constant (λ) plus a random term (ε). We also assume that λ can suffer a break after reform episodes. This leads to an equation that can be empirically estimated:

(3) $$\ln(y_t / y_{t-1}) = \lambda + \alpha \ln(k_t / k_{t-1}) + DREF + \varepsilon_t$$

where DREF is a dummy variable activated in the years in which the economy is considered to be "reformed."

In order to deal with the effect of short-run (or business cycle) fluctuations, which may disguise changes in capacity utilization as changes in TFP, we use three alternative procedures. First, we introduce in (3) a dummy variable (DREC1) that is activated in the years of recession, when aggregate output falls. A similar procedure is adopted by Lefort and Solimano (1994).[2] The justification for taking this approach is that during recessions firms may be forced to operate in a suboptimal fashion, with low levels of capacity utilization. This can lead to changes in measured TFP that do not reflect movements in the production frontier. Since our objective is to capture the effect of reforms on the long-run economic performance of countries, it is reasonable to purge the measured change in

TFP from the effect of recessions.[3] A second procedure that we use to account for the business cycle is to introduce a dummy variable (DREC2) into equation (3) that is activated in the years in which an index of TFP growth is negative. In practice, we calculate this index on the basis of equation (2) using a value of 0.4 for α.[4] The justification for using this procedure is an assumption, also made by Griliches and Lichtenberg (1984: 472) in a study on the long-run effects of research and development spending on TFP growth, that "true" productivity can only improve, so that measured reductions in TFP can only reflect short-term fluctuations.[5] The third procedure, also used by Griliches and Lichtenberg (1984), is to estimate equation (3) after averaging the variables over 5-year periods.[6]

Sachs and Warner (1995) define an economy as "open" in a given year if all the following conditions are simultaneously satisfied: (a) the coverage of nontariff barriers does not exceed 40 percent of foreign trade, (b) the average tariff rate does not exceed 40 percent, (c) the black market premium over the official exchange rate does not exceed 20 percent, (d) the economic system is not socialist, and (e) the state does not have the

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[2] Lefort and Solimano (1994) define a similar dummy (DREC) for the years 1975 and 1982 in the case of Chile, and for the years 1982-83 and 1986 in the case of Mexico (pp. 16 and 28). The authors also use a reform dummy (DREF), which they activate after 1973 for Chile and after 1985 for Mexico.

[3] In his paper on "issues in assessing the contribution of research and development to productivity growth," Griliches (1992) is concerned with a similar problem: "the usual measures of total factor productivity are very much affected by short-term fluctuations in capacity utilization. To get a correct measure of the shift in technological opportunities of an economy (or industry), some adjustments have to be made for it" (p. 111).

[4] The 0.4 average capital share in output is also used by Fischer (1993), Nehru and Dareshwar (1995), and Marfan and Bosworth (1994). Collins and Bosworth (1996) use a capital share of 0.35 in their study of TFP growth and assert that "we believe, from the existing literature, that a plausible range for the capital share is 0.3 to 0.4; and there is also considerable evidence that the capital elasticity is higher in developing countries than in industrial economies" (p. 155).

[5] Griliches and Lichtenberg (1984: 472) actually "allow the TFP series to only increase or stay constant, but not to decline, by resetting every 'lower' observation to the previously observed peak level".

monopoly on major exports (Sachs and Warner, 1995: 22). As shown in Figure 1, the subperiods with the highest percentage of "reformed" economies were the 1950s and the 1990s – one hundred percent of the countries were reformed after 1990. It is noteworthy that while Sachs and Warner were attempting to apply a somewhat "objective" criteria for classifying countries as "open" or "closed," criteria (c) - (e) are actually related with macroeconomic policy and the role of the state in production. Moreover, as mentioned earlier, trade liberalization in LAC has been implemented simultaneously with a broad set of reforms, and thus the periods of "openness" can also be interpreted as being periods of "reform."

Our main source of data is the data base on physical capital stocks, working-age population (aged 15 to 64) and gross domestic product (GDP) constructed by Nehru and Dareshwar (1993). This data base covers the period 1950-1990, but we updated it until 1995 using the World Bank's data base on World Development Indicators – the specific procedures that were used in this updating are described in the Appendix. The data for capital stocks was constructed by Nehru and Dareshwar (1993) using the perpetual inventory method applied to gross domestic fixed investment series. This data set has been used previously in studies of growth and openness by Harrison (1996) and Edwards (1997).

III. Results

Table 1 reports growth decompositions for the 18 countries of our sample, using 0.4 as the capital share in output. On average, in the period 1950-1995, these countries

[6] This is also the procedure adopted in the studies of income convergence across countries that use panel data. In these studies, as in the present paper, the motivation is that of purging long-run growth from the

grew at a rate of 3.5 percent, of which almost 50 percent is explained by capital accumulation, 45 percent by population growth and only 5 percent by the contribution of productivity growth.[7] In fact, six countries show negative contributions of productivity to GDP growth – Bolivia, El Salvador, Guyana, Nicaragua, Paraguay and Venezuela. It is worth noting that, even though the worst performer in TFP growth also has the lowest rate of GDP growth (Guyana), there is no clear correlation between the countries' rate of GDP growth and the contribution of TFP to this rate. However, evidence in favor of such a correlation is provided by the average growth decompositions for the periods 1950-1979, 1980-1989 and 1990-1995, reported in table 1. The data do show a positive relationship between output and productivity growth. During the 1980s, the rate of GDP growth fell to less than 20 percent of the figure for the previous three decades – from 4.4 percent to 0.8 percent – and the contribution of TFP to GDP growth went from 16 percent to minus 204 percent. During the first half of the 1990s, the rate of GDP growth came recovered, almost reaching its previous historical levels. However, the region's rate of capital accumulation remained at relatively low levels, and thus the contribution of TFP to overall growth increased to 31 percent, which is almost twice the average for the period that preceded the "lost decade" – as the eighties have been called by analysts of the LAC region.

Table 2 reports growth decompositions, both for the periods when the economies were reformed and for those in which they were not reformed. Only 6 out of the 18 countries experienced slower GDP growth in the periods of reform, during which the

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effect of short-run fluctuations – see, for example, Loayza (1994), Islam (1995) and Caselli, et al. (1996).

average rate of output growth was 4 percent, compared to 2.8 percent during the periods of no-reform. Growth in the capital stock and the labor force was in general more rapid in the periods of no-reform that in those of reform but, on average the difference in the contributions of these factors to GDP growth from one period to the other were relatively small – 0.3 and 0.2 percent for capital and labor, respectively. The contribution of productivity growth as a fraction of GDP growth went up from minus 17 percent to 29 percent, on average. In only 4 countries – Brazil, Guatemala, Honduras, and Mexico – this contribution went down when the corresponding economies were reformed. Moreover, during the periods of no-reform, 12 out of 18 countries showed negative contributions of TFP to output growth, while this only happened in two countries during the period of reform – Mexico and Paraguay.

A weakness of these growth accounting exercises is that a common figure for the share of capital in output is imposed a priori for all countries. One of the advantages of the econometric procedure based on the estimation of equation (3) on a country-by-country basis is that it allows the factor shares to differ across countries. Table 3 reports the coefficients on the constant and the variable DREF from the ordinary least squares (OLS) estimation of equation (3) one country at a time. They represent, respectively, the average rate of TFP growth in 1950-1995, and the change in this rate during the periods of reform. Table 3 also reports regression results with and without the introduction of recession dummies into equation (3). Overall, six countries show changes in average TFP growth during the periods of reform that are significant at the 5 or 10 percent confidence

[7] This result differs considerably from the 19 percent contribution of TFP to GDP growth found by De Gregorio (1992) in a study of 12 Latin American countries in the period 1950-1985.

intervals. Another three countries show changes in their TFP growth rates that are significant at the 15 percent level. Of these nine countries, five show changes in their rates of growth of TFP that are significant in at least two different specifications: Argentina, Bolivia, Chile, Guyana, and Venezuela. An important result is that in all the cases in which the coefficient on DREF is significant, it has a positive sign. In other words, whenever the economic reforms had an effect on the rate of TFP growth, this effect was positive.

Similar results are obtained when the estimation is performed using the seemingly unrelated regressions (SUR) technique, which takes advantage of the fact that the residuals of the country-specific regressions can be correlated as a result of geographic proximity and/or similarity of shocks affecting each LAC country. These results, with the two alternative recession dummies, are reported in Table 4. Again, nine countries show significant changes in their rates of TFP growth during their periods of reform. As with OLS, five countries – the same as before – present changes in TFP growth during the periods of reform that are significant with at least two different methods regarding the use of recession dummies. Finally, in all the cases in which reform brings about changes in the rate of growth of TFP these changes are positive.

The third method that we use to deal with the impact of short-term fluctuations on growth is that of estimating equation (3) without recession dummies but using, instead of annual data, averages over 5-year periods. This method, however, leaves us with too few observations to perform the estimation country by country. To deal with this problem, we pool the data in a single panel that includes all of the 18 countries. Implicit in this procedure is the assumption that the effect of reform on TFP growth is the same for all

countries. If this effect is in fact different across countries, our estimate can be interpreted as an average of the various country effects. The estimation is performed both using OLS and the fixed effects technique. The latter allows us to account for the presence of a country-specific term in the residuals of the regressions. Table 5 reports the results, which do not differ considerably between OLS and fixed effects: the average rate of growth of TFP is negative during the periods of no-reform (almost minus 1 percent), and becomes positive during the periods of reform -- the change in the growth rate being close to 1.5 percent.

Table 5 also reports the analysis performed with a panel that pools all the countries using annual data. As before, we perform the estimation with and without the introduction of recession dummies in order to control for the effects of the business cycle on measured productivity. Again, the results show very significant increases in the rates of TFP growth during the periods in which the economies were reformed. It can also be seen that the effect of reform is smaller when the recession dummies are introduced. This result can be attributed to the fact that the presence of the recession dummies in the regression leads to an increase in the estimated rate of TFP growth and that in our sample these variables are activated more frequently during the periods of no-reform than during years of reform – respectively 9 and 18 percent of the time for DREC1, and 34 and 43 percent for DREC2. Thus, the use of the recession dummies naturally causes the estimate of the average rate of growth of TFP to be bigger (smaller) during the periods of no-reform (reform). Nevertheless, a significant difference between the estimates of the two periods persists, and it is one that favors the hypothesis that economic reform is associated with faster TFP growth.

IV. Summary and Conclusions

In practice, it is difficult to disentangle the impact of economic reforms from other sources of growth. In particular, measured growth in productivity is subject to the effect of short-term fluctuations that can obscure the impact of reforms on long-run economic performance. Latin America and the Caribbean constitutes an interesting case for the study of the dynamic effects of economic reforms. For decades this region had been characterized by having some of the most interventionist policies in the world. However, in recent years most of the Latin American countries implemented economic reforms at a speed that is seldom found in the developing world. Whether this has had noticeable effects on their productivity performance is the question that we have intended to address in this paper.

We have adopted a simple approach, in which productivity growth appears as the unexplained residual in a growth accounting exercises with two factors of production – labor and capital. We have then compared the average rate of growth of TFP in the periods in which the Latin American economies were reformed to that of periods when they were not reformed. The criteria that we have used for identifying the periods of reform are mostly policy-based, taking into account the levels of the average tariff rates, the average nontariff barriers to imports, the premium on the black market exchange rate, and the existance of state monopolies in export industries. They have led us to classify the 18 countries in our sample – which represent more than 95 percent of the regional output – as reformed, on average, more than one third of the time in the 45 years from 1950 through 1995.

The main conclusion from this exercise is that productivity growth was on average faster during the periods of reform of the LAC economies. In fact, when a common factor share is assumed for all countries – either imposing it a priori or uncovering it from the data – we find that the contribution of productivity to GDP growth was on average negative or insignificant during the periods in which the economies were not reformed, but it became positive during the periods of reform.

One weakness of the previous results is that they could be due to the effect of short-term fluctuations in output. Indeed, it is a widely accepted belief that because capacity utilization fluctuates with the business cycle, measured TFP is procyclical. Thus, it is possible that the higher TFP growth observed during the periods of reform could be due to the fact that, at least in our sample, recessions have been less frequent during these periods. Furthermore, it would be desirable to distinguish the short-term changes in TFP from those that are associated with the long-run component of growth, typically associated with technological change. For these reasons, we have followed previous studies in introducing in our estimated growth equation two alternative dummy variables that control for the years of recession in the economy. These variables are activated either when GDP goes down, or when an index of TFP growth is negative – a phenomenon that in theory could not affect the long-term component of TFP.

The introduction of the recession dummies in the estimation with the panel of countries with annual data causes, as expected, an increase in the estimated rate of growth of TFP during the years when the LAC economies were not reformed, which in fact becomes positive, and a decrease in this rate in the periods of reform. However, the

difference between these rates remains highly significant, and still favors the hypothesis that the periods of reform are associated with a higher rate of TFP growth.

We have also estimated the effect of reforms on a country by country basis, both using ordinary least squares (OLS) and the seemingly unrelated regressions (SUR) technique. We find that 11 out of 18 countries show significant changes in TFP growth when going from non-reform to reform, with at least one method of estimation. However, in only 7 countries this result is robust to changes in the estimation technique (OLS or SUR), and in only 5 countries the result persists both with and without controlling for short-term fluctuations through the introduction of a recession dummy. It is important to stress that whenever a significant difference is encountered between the rates of TFP growth during the periods of non-reform and reform of the LAC economies, these differences indicate that growth was relatively faster during the latter periods.

Why has the impact of reform on TFP growth been positive in some countries and nonexistent in others? One could speculate that the answer could be related to a possibly longer period of reform in the former. However, this is apparently not the case: In the 5 countries in which the significance of the effect of reforms on growth suffers the least from robustness problems the average length of the period of reform is 16 years (out of 45), which is almost the same as the average for the whole sample of countries. Another possible explanation could be related to the size of the countries involved, but this does not seem to apply either, as the 5 countries mentioned above have very different sizes – e.g. Argentina and Bolivia.

In fact, the explanation of the variety of results found at the country level probably lies in factors that go beyond the scope of this paper. From an historical point of

view, we know that in many of the countries in our sample, the recent wave of reforms has been quite diverse across countries. Thus, to understand why some countries have experienced higher rates of productivity growth during their periods of reform while others have not, it would be necessary to analyze the details of the packages of policy reform that have been implemented.

Moreover, from a theoretical point of view, we should expect different dynamic responses to the reforming of an economy, depending on its specific structural characteristics. For example, the initial stocks of knowledge in each country, the sectoral composition of output, and the degree to which each country has a comparative advantage in relatively more dynamic industries are all plausible explanations of the different responses of TFP growth to economic reforms. A detailed consideration of these factors would certainly contribute to the understanding of the results encountered in this paper. It is, we believe, a promising avenue for future research. However, such an analysis would have to go beyond the use of aggregate data, as in this paper, and would require the use of trade and productivity data at the industry level.

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APPENDIX :
UPDATING THE NEHRU AND DARESHWAR (1993) DATA BASE

The data base constructed by Nehru and Dareshwar (1993) for the period 1950-1990 was updated until 1995 for the 18 Latin American countries considered in this paper. To this end, we used information from the World Bank's "World Development Indicators Data Set" (WDI). A brief description of the procedures used in this updating are described in this appendix.

1) Capital Stocks

This series was calculated using the perpetual inventory method, which is based on the following accumulation equation:

$$K_t = (1- d)^t K(0) + \Sigma(1- d)^i I_{t-i} \quad (1)$$

where K_t is the capital stock at time t (in 1987 prices), K(0) is the initial capital stock (in period 0), I_{t-i} is the Gross Domestic Fixed Investment in period t-i, and d is the depreciation rate. Nehru and Dareshwar (1993) estimate K(0) by a modification of a technique proposed by Harberger(1978). The procedure is based on the assumption that in steady state the rate of growth of output (*g*) is equal to the rate of growth of capital stock. By re-arranging (1), this rate can be written:

$$(K_t-K_{t-1})/K_{t-1} = -d +(I_t/K_{t-1}) \quad (2)$$

which, by the above assumption, implies

$$K_{t-1} = I_t/(g+d) \quad (3)$$

Thus, in period 0, the capital stock can be calculated as:

$$K(0) = I_1/(g+d)$$

Nehru and Dareshwar (1993) calculate I_1 as the fitted value of a log-linear trend of I_t, adjusting for trend-breaks when appropriate. The depreciation rate is assumed to be 4 percent, and *g* is derived from the series of real GDP at market prices. Equation (1) is then applied to calculate the rest of the values of K_t. To continue this procedure for the post-1989 values, we used data on Gross Domestic Fixed Investment (GDFI), available for all countries except for Argentina. For this country, only the data on Gross Domestic Investment (GDI) was available. To solve this problem, we regressed the log of the ratio of GDFI to GDI on a linear and a quadratic trend, using the years for which both variables were available (from 1970 to 1990). The estimates were then used to extrapolate the figures of GDFI from 1990 through 1995.

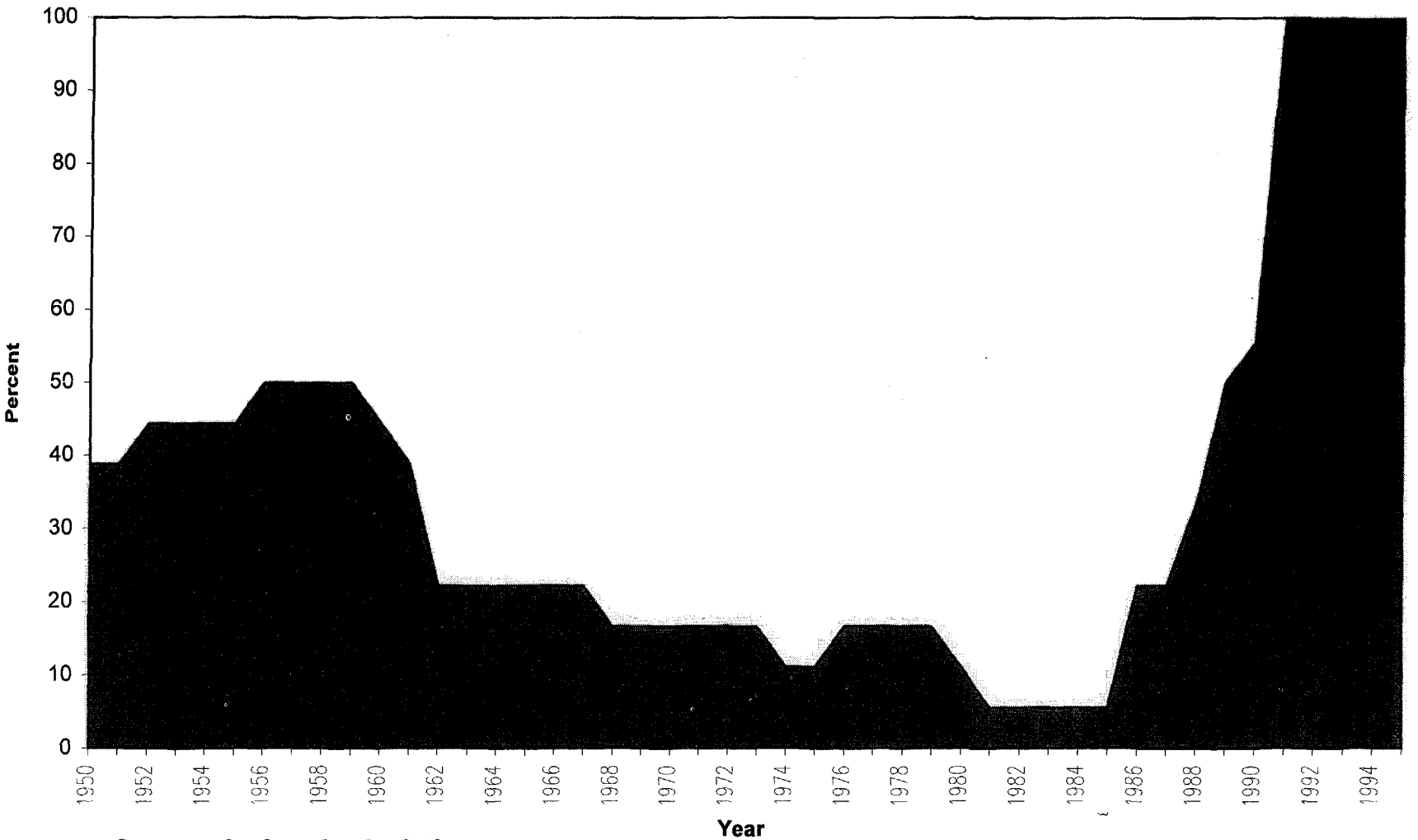
2) Gross Domestic Product

While comparing the WDI data for this series with the data from Nehru and Dareshwar (1993), we found considerable discrepancies in the levels but not in growth rates of the series. Thus, we performed the updating by multiplying the 1988 levels from the original source by the subsequent years' rates of growth, as derived from the WDI data base.

3) Labor Force

Nehru and Dareshwar (1993) use the population aged 15-64 years as a proxy for the labor force. Their data covers the period from 1960 to 1988. We updated this series with WDI data for the period 1989-1995. For the period 1950-1959, however, we only had access to data on total population. Thus, we regressed the log of the ratio of the working-age population to the total population on a linear and a quadratic trend, with data on the period 1960-1995. We then used the fitted values of this regression to extrapolate the figures for the working-age population from 1950 through 1959.

Figure 1: "Open" LAC Countries as a Percentage of Total, 1950-1995



Source: Authors' calculations.

Table 1: Growth Decomposition, period: 1950-1995 (in percent)

Country	GDP growth	Capital	Labor	Productivity	(4)/(1) (in percent)
	(1)	(2)	(3)	(4)	(5)
Argentina	2.2	1.2	0.8	0.2	9
Bolivia	2.4	1.2	1.4	-0.2	-10
Brazil	5.1	2.4	1.7	1.0	19
Chile	3.5	1.3	1.4	0.8	24
Colombia	4.5	1.8	1.8	0.9	21
Costa Rica	5.0	2.5	2.2	0.3	6
Ecuador	4.8	1.9	1.8	1.0	22
El Salvador	3.5	2.1	1.5	0.0	-1
Guatemala	3.8	1.8	1.8	0.2	5
Guyana	1.0	0.8	1.4	-1.1	-112
Honduras	3.8	1.9	1.7	0.2	5
Jamaica	2.7	1.3	0.8	0.7	25
Mexico	4.6	2.6	1.8	0.3	5
Nicaragua	2.3	2.0	1.9	-1.6	-69
Paraguay	4.2	2.7	2.0	-0.4	-10
Peru	3.5	1.5	1.5	0.5	14
Uruguay	1.8	0.4	0.4	1.0	54
Venezuela	3.3	1.4	2.2	-0.3	-10
Average	3.5	1.7	1.6	0.2	5
Avg. 50-79	4.4	2.1	1.6	0.7	16
Avg. 80-89	0.8	1.0	1.5	-1.7	-204
Avg. 90-95	3.5	1.0	1.5	1.1	31

Source: Authors' calculations.

Table 2: Growth Decomposition in Periods of Reform and No-Reform of the Economy, 1950-1995 (in percent)

Country	GDP growth (1)		Capital (2)		Labor (3)		Productivity (4)		(4)/(1) (in percent) (5)	
Status	No-Reform	Reform	No-Reform	Reform	No-Reform	Reform	No-Reform	Reform	No-Reform	Reform
Argentina	1.9	4.9	1.4	-0.2	0.8	1.0	-0.3	4.1	-13	84
Bolivia	-0.3	3.1	1.0	1.2	1.3	1.5	-2.6	0.5	789	15
Brazil	5.4	2.5	2.6	0.9	1.8	1.4	1.0	0.2	19	8
Chile	2.4	4.9	1.4	1.2	1.5	1.2	-0.4	2.4	-18	50
Colombia	4.6	4.4	1.8	1.6	1.9	1.5	0.8	1.3	18	30
Costa Rica	4.7	5.4	2.6	2.4	2.1	2.2	-0.1	0.8	-2	15
Ecuador	1.9	5.5	0.9	2.1	1.8	1.9	-0.9	1.5	-46	27
El Salvador	2.8	4.5	2.1	2.1	1.4	1.5	-0.7	0.9	-23	21
Guatemala	3.9	3.7	1.9	1.7	1.7	1.8	0.3	0.1	7	3
Guyana	0.6	2.7	1.0	-0.3	1.5	0.6	-1.8	2.4	-288	88
Honduras	4.1	3.2	2.0	1.7	1.9	1.3	0.3	0.1	6	4
Jamaica	1.6	4.1	0.9	1.8	1.0	0.6	-0.3	1.7	-16	42
Mexico	5.7	0.9	3.0	1.3	1.8	1.6	0.9	-1.9	16	-204
Nicaragua	1.4	4.3	2.0	2.1	2.0	1.9	-2.6	0.3	-185	7
Paraguay	4.3	3.5	2.8	2.0	2.0	1.7	-0.4	-0.2	-10	-7
Peru	1.6	5.5	1.3	1.8	1.8	1.2	-1.5	2.6	-98	47
Uruguay	1.7	2.8	0.4	0.4	0.4	0.4	0.8	2.0	50	71
Venezuela	2.3	5.6	1.4	1.5	2.2	2.3	-1.3	1.8	-55	33
Average	2.8	4.0	1.7	1.4	1.6	1.4	-0.5	1.1	8.5	18.4

Source: Authors' calculations.

Table 3: Total Factor Productivity Growth: Average in 1950-1995 and Change During Periods of Reform(*), OLS Regressions (Percent)

Recession Dummy	None		DREC1		DREC2	
Country / Period	1950-95	Reform (change)	1950-95	Reform (change)	1950-95	Reform (change)
Argentina	-1.4 (0.154)	6.9 (0.008)	2.1 (0.001)	3.9 (0.005)	2.3 (0.001)	4.0 (0.005)
Bolivia	-2.5 (0.032)	2.9 (0.026)	0.3 (0.688)	1.2 (0.186)	0.7 (0.441)	1.6 (0.084)
Brazil	-1.3 (0.245)	1.7 (0.400)	0.4 (0.651)	1.4 (0.350)	2.1 (0.010)	0.6 (0.614)
Chile	-1.3 (0.229)	2.9 (0.047)	1.8 (0.059)	1.9 (0.079)	2.9 (0.009)	0.2 (0.847)
Colombia	0.4 (0.485)	0.4 (0.593)	0.4 (0.485)	0.4 (0.593)	2.3 (0.000)	-0.5 (0.271)
Costa Rica	-1.7 (0.201)	1.3 (0.263)	0.3 (0.786)	1.2 (0.184)	0.9 (0.316)	0.9 (0.227)
Ecuador	-0.9 (0.570)	3.1 (0.159)	1.3 (0.469)	0.7 (0.740)	1.5 (0.318)	2.8 (0.127)
El Salvador	-1.3 (0.139)	1.5 (0.136)	0.5 (0.465)	0.2 (0.761)	1.1 (0.162)	0.9 (0.260)
Guatemala	-0.3 (0.581)	0.1 (0.931)	0.7 (0.145)	-0.7 (0.238)	1.0 (0.011)	0.4 (0.328)
Guyana	-1.5 (0.069)	6.0 (0.007)	1.2 (0.091)	4.8 (0.003)	3.3 (0.001)	3.0 (0.054)
Honduras	-0.3 (0.739)	-0.2 (0.864)	0.9 (0.181)	0.0 (0.962)	2.5 (0.000)	-0.6 (0.397)
Jamaica	-0.5 (0.53)	0.1 (0.93)	2.0 (0.028)	-1.2 (0.337)	3.1 (0.000)	-0.5 (0.611)
Mexico	-3.5 (0.004)	1.2 (0.372)	-0.8 (0.415)	1.9 (0.956)	0.9 (0.753)	3.8 (0.899)
Nicaragua	-4.2 (0.001)	2.3 (0.248)	-0.9 (0.543)	1.9 (0.299)	0.9 (0.549)	3.8 (0.028)
Paraguay	-1.3 (0.099)	0.4 (0.784)	0.0 (0.990)	-0.7 (0.536)	1.5 (0.020)	1.1 (0.238)
Peru	-1.5 (0.132)	2.4 (0.16)	0.8 (0.327)	2.0 (0.112)	2.2 (0.024)	0.0 (0.947)
Uruguay	0.9 (0.223)	1.1 (0.587)	2.9 (0.000)	0.4 (0.785)	3.3 (0.000)	-0.2 (0.862)
Venezuela	-1.2 (0.18)	3.2 (0.049)	0.5 (0.458)	2.1 (0.075)	3.5 (0.000)	0.8 (0.440)

Notes: (*) The average for the period 1950-95 is the coefficient on the constant in equation (3), while the change during the periods of Reform is the coefficient on the variable DREF in equation (3); P-values in parenthesis; DREC is activated when GDP growth is negative; DREC2 is activated when TFP growth (calculated with a capital share of 0.4) is negative. Source: Authors' calculations.

Table 4: Total Factor Productivity Growth: Average in 1950-1995 and Change During Periods of Reform(*), Seemingly Unrelated Regressions (Percent)

Recessions Dummy	None		DREC1		DREC2	
Country / Period	1950-95	Reform (change)	1950-95	Reform (change)	1950-95	Reform (change)
Argentina	-1.3 (0.123)	9.9 (0.002)	1.9 (0.002)	5.4 (0.016)	2.0 (0.000)	6.4 (0.002)
Bolivia	-1.2 (0.14)	1.3 (0.126)	0.3 (0.683)	1.1 (0.108)	0.4 (0.459)	1.6 (0.003)
Brazil	-0.6 (0.548)	-0.3 (0.918)	1.2 (0.161)	-3.0 (0.213)	2.3 (0.001)	3.2 (0.065)
Chile	-1.9 (0.064)	4.6 (0.000)	1.4 (0.148)	2.5 (0.029)	4.0 (0.001)	-0.7 (0.576)
Colombia	0.6 (0.236)	0.5 (0.446)	0.3 (0.473)	0.5 (0.476)	2.4 (0.000)	-0.6 (0.173)
Costa Rica	0.4 (0.7)	-1.0 (0.27)	1.5 (0.115)	-0.4 (0.610)	1.3 (0.078)	9.2 (0.132)
Ecuador	0.3 (0.881)	1.7 (0.460)	2.3 (0.152)	0.3 (0.891)	2.0 (0.155)	4.2 (0.029)
El Salvador	-1.6 (0.03)	1.8 (0.072)	0.4 (0.484)	-0.2 (0.774)	0.5 (0.571)	1.0 (0.234)
Guatemala	-0.3 (0.509)	0.1 (0.804)	1.0 (0.029)	-0.7 (0.155)	0.9 (0.010)	0.3 (0.383)
Guyana	-1.6 (0.048)	3.3 (0.105)	1.2 (0.097)	4.2 (0.013)	3.0 (0.001)	1.6 (0.291)
Honduras	-0.2 (0.792)	0.6 (0.588)	0.5 (0.379)	0.7 (0.362)	3.1 (0.000)	-0.3 (0.755)
Jamaica	-0.7 (0.372)	0.5 (0.675)	2.0 (0.014)	-1.2 (0.231)	3.0 (0.000)	-0.2 (0.749)
Mexico	-2.5 (0.002)	0.6 (0.540)	-0.7 (0.294)	0.4 (0.594)	0.9 (0.346)	-0.3 (0.758)
Nicaragua	-4.5 (0.000)	0.0 (0.994)	-1.6 (0.276)	0.3 (0.873)	0.7 (0.644)	1.8 (0.349)
Paraguay	-1.2 (0.074)	-1.1 (0.475)	0.1 (0.784)	-1.0 (0.378)	1.8 (0.001)	0.6 (0.513)
Peru	-1.6 (0.086)	1.3 (0.400)	0.7 (0.332)	1.1 (0.306)	1.6 (0.046)	-1.5 (0.151)
Uruguay	0.6 (0.369)	0.0 (0.995)	2.5 (0.000)	-0.8 (0.555)	2.6 (0.000)	-1.8 (0.271)
Venezuela	-1.3 (0.133)	4.0 (0.009)	0.6 (0.345)	2.9 (0.010)	3.5 (0.000)	-0.4 (0.704)

Notes: (*) The average for the period 1950-95 is the coefficient on the constant in equation (3), while the change during the periods of Reform is the coefficient on the variable DREF in equation (3); P-values in parenthesis; DREC is activated when GDP growth is negative; DREC2 is activated when TFP growth (calculated with a capital share of 0.4) is negative. Source: Authors' calculations.

Table 5: Total Factor Productivity Growth: Average in 1950-1995 and Change During Periods of Reform(*), Pooled OLS and Fixed Effects with Five-Year Averages and Annual Data (Percent)

Recessions Dummy	None		DREC1		DREC2	
Method / Period	1950-95	Reform (change)	1950-95	Reform (change)	1950-95	Reform (change)
Pooled OLS 5-Year Averages(**)	-0.8	1.3	--	--	--	--
	(0.003)	(0.000)				
Fixed Effects 5-Year Averages(**)	-0.9	1.5	--	--	--	--
	(0.001)	(0.000)				
Pooled OLS Annual Data	-1.0	1.5	1.1	0.6	2.0	0.9
	(0.000)	(0.000)	(0.000)	(0.007)	(0.000)	(0.000)
Fixed Effects Annual Data	-1.2	1.7	1.0	0.9	1.9	1.0
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)

Notes: -- Not available; (*) The average for the period 1950-95 is the coefficient on the constant in equation (3), while the change during the periods of Reform is the coefficient on the variable DREF in equation (3); (**) the variable DREF is activated in the periods in which the economy is open most of the time; P-values in parenthesis; DREC is activated when GDP growth is negative; DREC2 is activated when TFP growth (calculated with a capital share of 0.4) is negative. Source: Authors' calculations.

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